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NOTES

METHODS USED IN MEASURING UNEMPLOYMENT

By Ernest S. Bradford*

Unemployment, as the term is used in this discussion, relates to the manufacturing and mechanical industries, including the building and hand trades, and, to a less extent, to transportation and mining. This is partly because the records kept by responsible statistical bodies in the United States are confined mainly to wage earners in manufactures and in building. The data available regarding unemployed persons in agriculture, retail and wholesale trade, domestic service, and the clerical occupations are in most instances too meager to constitute a substantial body of reliable statistics.

EMPLOYED PERSONS

In studying the unemployed it is necessary first to separate those gainfully employed into two classes, (1) employees, and (2) employers and those who are self-employed. Employees are those who work for an employer, the latter supplying the equipment, including factory, machinery, and tools, the former performing a certain part of the useful work required in the conversion of materials, and receiving for their services wages or salary. Idleness affects persons thus employed more seriously than employers or the self-employed. The farmer, the professional man, and other independent operators also frequently have greater resources than the wage earner. The seriousness of a condition of wide unemployment, therefore, is of first concern to those who are employees.

Of the total number of persons gainfully employed in 1920, amounting to between 41,000,000 and 42,000,000, according to preliminary figures based on returns from 32 states, there are possibly 30,000,000 who may properly be called employees.† Of this number between 15,000,000 and 16,000,000 are found in the group of manufacturing and mechanical industries, extraction of minerals, and transportation.

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* Mr. Bradford was a member of the Economic Advisory Committee of the President's Conference on Unemployment.

† Dr. Willford I. King estimates the number of employees in 1918 as 30,224,000, excluding about 9,750,000 entrepreneurs and the members of farmers' families who are working on their home farms. The writer's estimate is about the same for 1920, based on a detailed splitting of the occupations groups of the census into employees and others.

These are the persons whose unemployment we are particularly concerned in measuring.

MEASURING UNEMPLOYMENT

There are two principal methods of measuring unemployment: (1) the method of counting or directly estimating the number of unemployed; (2) the indirect method of estimating the reduction in the number of persons employed at certain times or between one date and another. It is assumed in the latter case that the difference between the maximum and the minimum number of employees (or persons on pay-rolls) represents the unemployed, at least at the particular time in question, or during a certain period. Figures arrived at by both of these methods were taken into account in estimating the number at present unemployed for the President's Conference on Unemployment, recently held in Washington.

The same two methods may also be used in measuring the number of unemployed over a series of years, and in arriving at the amount of normal or average unemployment. The records available in this country for a study of unemployment fall into one or the other of these two classes.

DIRECT MEASUREMENT OF UNEMPLOYMENT

The direct method of attempting to secure the number of unemployed persons has been used by the Massachusetts Department of Labor and Industries since 1908, and is based on the records of unemployment among organized wage earners. The number of labor organizations reporting to the Bureau of Statistics of the State Department of Labor and Industries includes about 250,000 members, roughly 75 per cent of the total number of union wage earners in the state. This is regarded as a large enough proportion to be typical of the organized wage earners of the entire state. The figures appear to have been collected on a uniform plan, year after year, and to be compiled with care. There is no reason to believe that the percentage of unemployment if taken in the middle instead of at the end of each quarter, or even at the end of each month, would materially change the unemployment average for the year. It is also believed that the percentage of union unemployment represents fairly well the unemployment of all industrial labor in this state—at least unemployment is not less among the non-union unskilled workers than among the organized workers, who are skilled for the most part, and who have the help of the union, when out of work, in finding a new job.

There is some evidence that the percentages of union and non-union unemployment are about the same in the leading industries of Massachusetts during the present depression. A census of the reduction in employment in textiles, boots and shoes, and metals and machinery, taken December 18, 1920, showed closely similar percentages to those of union unemployment in the same industries at the close of the quarter, December 31, 1920.

Similar figures of union unemployment in the state of New York were collected from representative labor unions each month from 1904 to the middle of 1916, when this series was discontinued and the number of employees on pay-rolls of representative factories was collected instead. The number of members of unions reporting as to idleness was gradually increased from about 100,000 in 1904 to about 200,000 in 1916, there being in 1914 about 140,000 in unions reporting. This is regarded as a large enough number to be roughly typical of industry in the state, particularly since the localities and the unions were selected with this in mind. The figures are therefore believed to be fairly representative of unemployment as a whole in New York, and also of unemployment in at least four leading industries.

In order to translate unemployment percentages into a unit which shall have significance and shall also be comparable with other percentages, it is necessary to have a definite time element present. If 10 per cent of the wage earners are unemployed at the end of each month, even though the actual persons unemployed are different from one month to the next, the average percentage of unemployment for the year is 10 per cent. It is assumed that the average of the percentages of unemployment taken at the end of each month will not differ greatly from the average of percentages taken at the middle of each month, or at any other time during the month.

The good points of the union unemployment figures of Massachusetts and New York are:

1. They have been collected regularly.
2. They have been collected by recognized statistical bureaus.
3. They have been obtained from secretaries of labor unions who are presumably well informed as to employment of members (except in the largest unions), although they are not statisticians.
4. Even if not absolutely correct, the figures represent relatively correct fluctuations from month to month or quarter to quarter.

On the other hand:

1. The figures may be exaggerated by union secretaries, giving higher unemployment estimates during depressions and lower estimates during good times than actual conditions warrant.
2. They may be intentionally exaggerated.

3. They may be too low to hold true of labor in general, since they apply only to union labor, which is skilled labor and not so often out of work as the non-union and unskilled.

These last points tend to offset one another. Further, experience in dealing with the less exact types of statistics in business and industry tends to the belief that these figures are fairly correct, especially in Massachusetts.

In using these figures it was assumed that (a) the unemployment of union industrial workers is roughly typical of general industrial unemployment in these states; and (b) these states are probably typical of other large industrial states.

Examination of the industries involved in these states does not reveal any reason to believe that unemployment would differ markedly in industries not represented.

REDUCED EMPLOYMENT AS A MEASURE OF UNEMPLOYMENT

The other principal method of estimating unemployment is to measure the differences between two or more employment levels. The state of New York, for example, since 1914 has collected figures showing the number of persons on the pay-rolls of certain representative factories, numbering approximately 1,600 plants and averaging between 500,000 and 600,000 wage earners—more than one-third of the factory workers of the state. The index number used in this method, starting with 100 per cent in July, 1914, reached 125 in March, 1920, and fell to 90 in June, 1921; 88 in July; 88.1 in August; and rose to 91.5 in September.

The state of Wisconsin has been using a similar system since 1915, and its employment curve parallels closely that of New York. About a third of the industrial wage earners of the state are represented.

The state of New Jersey has kept a record of the number of wage earners employed in its industries from 1898 up to and including 1918. These figures cover almost all of their industrial wage earners, and thus afford an excellent index of employment for that state. The figures for 1919 are not yet available because they were collected by the United States Census of Manufactures. The figures for 1920 are also still lacking.

Massachusetts takes an annual census of manufactures which shows the number of wage earners employed each month by the industries of the state. This furnishes also an employment curve of similar significance.

The Bureau of Labor statistics since October, 1915, has published in the *Monthly Labor Review* the number of persons on the pay-rolls of certain representative factories, numbering about 1,400 and representing from 600,000 to 800,000 employees. Identical establishments are compared as between any two consecutive months, but they are not identical for all the months of the year, as are the New York payroll figures. They cover 14 industries and more than 15 states, supplying information over a wider range of territory than any single state. The industries covered are well known to readers of this magazine. This supplements the data of the several states.

The method used by the United States Employment Service in January, 1921, and again in September, 1921, consisted in securing directly from certain states and cities the reduction in the number of persons reported as employed, as between January, 1920, and January, 1921. The value of this estimate naturally depends upon the care with which the figures were gathered in each state—whether by trained statisticians, and by what methods. It seems clear that information collected by a state or a federal bureau of statistics of industry or labor in a methodical and consistent manner, along lines previously found to yield dependable figures, as in Massachusetts or New York, should be regarded as more reliable than miscellaneous estimates obtained by a Chamber of Commerce or a Board of Trade, inexperienced in this field, through persons varying in statistical abilities and opportunities. Whether or not the estimate of 3,473,000 persons unemployed as of January, 1921, arrived at in this manner, is a close one depends upon the extent to which the data were collected through trained and responsible persons and on how far miscellaneous guesses were incorporated along with the estimates of properly organized statistical bureaus.

The monthly figures of unemployment published in the *Industrial Employment Survey Bulletin* (which are not to be confused with the foregoing estimate of reduced employment as of January, 1921, compared with January, 1920) and the curve which accompanies them were intended to indicate the trend of industrial employment from month to month. Pay-roll data were secured from about 1,400 concerns, usually employing 500 or more persons each, located in 65 industrial centers and representing in the aggregate 1,500,000 wage earners at the lowest point, July, 1921. The first figures in this series give the total number of workers on pay-rolls in such plants in February, 1921, compared with January, 1921, and they have been carried on currently each month since. They cover concerns in 14 groups of industries, and follow closely the census classification. They also show increases and decreases in factory employment by cities as well as by groups of industries. This method is similar to that employed in New York state and in Wisconsin, but covers a wider area and takes in only the larger concerns.

Several of these ways of measuring unemployment result in figures which agree rather closely with one another as to the extent of the reduction in employment between January, 1920, and the present time. The New York index of factory employment dropped from 123 in January, 1920, to 88.1 in August, 1921—35 points, or 28 per cent. The index of the Bureau of Labor Statistics dropped from 106 in January to 82 in July, 1921—24 points, or 23 per cent. Unemployment in Massachusetts rose from 4.1 at the end of December, 1919, to 25.9 on July 1, 1921, or 21.8 more than at the beginning of 1920.

All of these figures point to the same approximate conclusion that between January 1st, 1920, and September 1st, 1921, employment fell about 25 per cent. Applying this percentage to the 12,000,000 employees engaged in manufacturing and mechanical occupations, we find about 3,000,000 fewer factory wage earners employed in September, 1921, than in January, 1920. If we add mining, in which the reduction in employment in January, 1921, from January, 1920, was, say, 250,000, and railway transportation, in which the reduction was about 450,000, we have a reduction of 700,000 more. These figures do not take into account a considerable number of persons who were changing jobs, sick, or on strike; they represent reduced employment rather than actual unemployment, which latter is somewhat greater. Even a small addition to this 3,700,000 would bring the total up to about 4,000,000 fewer employed, not including persons in trade, agriculture, domestic service, or clerical occupations. The number which should be added from these fields cannot be estimated because of the lack of data. The increase which should be made on this account will be offset to some extent by the fact that we are measuring from an abnormally high peak, namely, January, 1920, when many persons, including women and boys not normally employed, were on pay-rolls. It is also offset partly by the fact that some persons taken off factory pay-rolls are taking other jobs and are therefore not unemployed; there is little evidence, however, that this movement has been carried as far during 1921 as many seem to believe. The evidence points to an aggregate of reduced employment of about 4,000,000 in the manufacturing industries, mining and transportation, without attempting to estimate the situations in other occupations, in which, however, there is unquestionably a much smaller proportion of reduced employment.

CENSUS OF MANUFACTURES

The figures of the United States Census of Manufactures, gathered every five years, showing in each industry the average number of persons employed on the fifteenth day of each month, or on the nearest representative day, are helpful in this connection. The available data indicate the up and down movements in employment, and hence in unemployment, in general and for particular industries during the year for which they are given. For the four intervening years between censuses, however, figures are missing.

In a general way, it may be said that the method of measuring unemployment through reduced employment—that is, from the top down—fails to include the percentage of those who are always out of work. By this is meant not the unemployable, but, as already stated, those persons (of whom there is always a certain per cent) who are changing jobs and are on no pay-roll, and those who are sick or on strike. These are not always the same individuals, but the total average percentage seems to remain fairly constant.

On the other hand, the method of measuring unemployment by considering the unemployed among organized workers—from the bottom up, as it were—tends to exaggerate the existing conditions, the secretary of the union being inclined to report fewer persons unemployed during good times than there actually are, and more unemployed than there actually are during seasons of depression. However, it is not quite correct to use the term "from the bottom up" since there is no measure of the unemployment among a great mass of unskilled and unorganized workers, who are frequently referred to as being at the bottom of industry.

The method of measuring unemployment through fluctuations in the total number of employed entered on factory pay-rolls, as reported by the United States Census of Manufactures, is open to another objection, namely, that when all persons in industry are taken as a whole, the range from the maximum to the minimum number employed is much less than it would be if each industry were taken separately and the separate differences between maximum and minimum were then all averaged. In other words, if industry is regarded as a single labor reservoir, the range in 1914 and in 1909 between the high and the low level is only about 8 per cent; whereas if it is regarded, more accurately, as a series of smaller reservoirs, passage from one of which to another is not free, the average of the ranges runs around 15 per cent. If this process is pursued further and each plant or establishment is taken as the employing unit, which is still nearer to existing conditions—presenting, in effect, a much larger number of still smaller reservoirs or employing units of labor—the average of the difference in levels rises still higher to an undetermined number, equivalent to perhaps 20 or 25 per cent. In terms of *constant unemployment,* the percentage is about half as great as this difference between high and low.

In a large country of such extended industrial interests as the United States, the lack of adequate statistics on employment matters is surprising. Only by the most persistent and painstaking analysis can existing data be made to yield an explanation likely to fit the facts. At a time like the present when we need to know how much unemployment there is, how it compares with past unemployment, how much is seasonal, how much is cyclical or depressional, and how rapidly it is growing or waning, we are confronted with huge gaps in our statistical knowledge, to be bridged only by those who have detailed information regarding conditions in a number of particular industries. The first need, therefore, is for better unemployment data.

Suggestions for better statistics of unemployment may be summarized as follows:

1. In every industrial state records should be kept both of employees on pay-rolls and of union unemployment in order to supply an adequate basis of fact in both respects. These records should cover not only the manufacturing and building trades, but also mining, transportation and trade.

2. These figures should be collected regularly, preferably by *months* rather than by quarters.

3. They should be collected by some responsible statistical body, preferably a public bureau, organized to handle industrial or labor statistics.

4. Unemployment due to sickness and labor disputes should be separated from that due to lack of work or material.

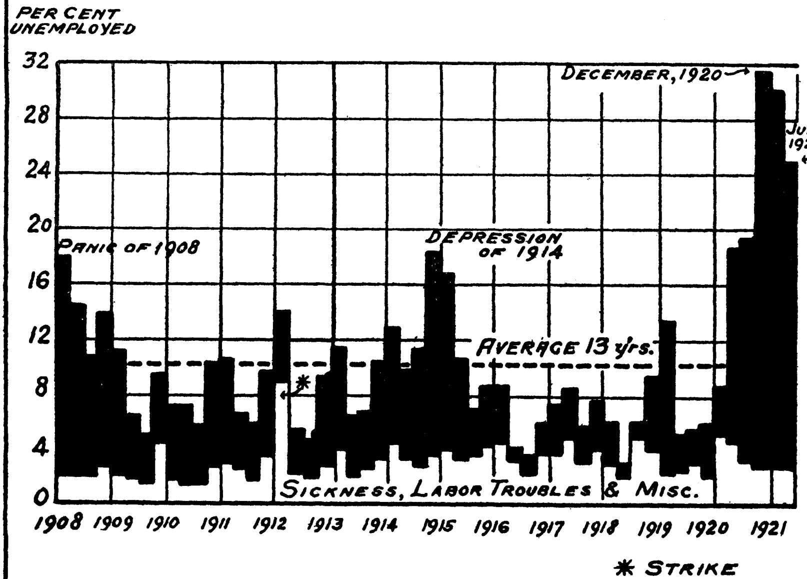
5. The figures should show partial unemployment (part time employment) as well as complete unemployment.

6. The data should be published frequently in order to keep the employer, the employee, and the public constantly informed as to the state of business and of unemployment. There is no better barometer of industrial conditions than an unemployment index. It also acts as a warning as to the degree of social ill-being existing when men are out of work, hungry, and discontented.

7. Figures of wages and hours of work can be collected to advantage at the same time; wages multiplied by hours of employment show the wage earner's income and therefore his purchasing power.

8. Only one report or set of figures should have to be prepared by the individual employer or union. In order to reduce the burden of compiling data, when the federal government and the state both require information, arrangement should be made for one office to collect the data and supply it to the other, as is now done, for example, by the state of Massachusetts.

FLUCTUATIONS in UNEMPLOYMENT
IN MASSACHUSETTS, 1908-1921
PERCENTAGES OF ORGANIZED WAGE EARNERS UNEMPLOYED AT END OF EACH QUARTER



ABOUT 250,000 WAGE EARNERS IN 1920 WERE COVERED BY THESE REPORTS, OF WHOM ABOUT 80,000 WERE UNEMPLOYED JAN. 1, 1921.

THE HIGHEST POINT OF UNEMPLOYMENT IN MASSACHUSETTS WAS REACHED AT THE CLOSE OF 1920. IT HAS FALLEN SINCE.

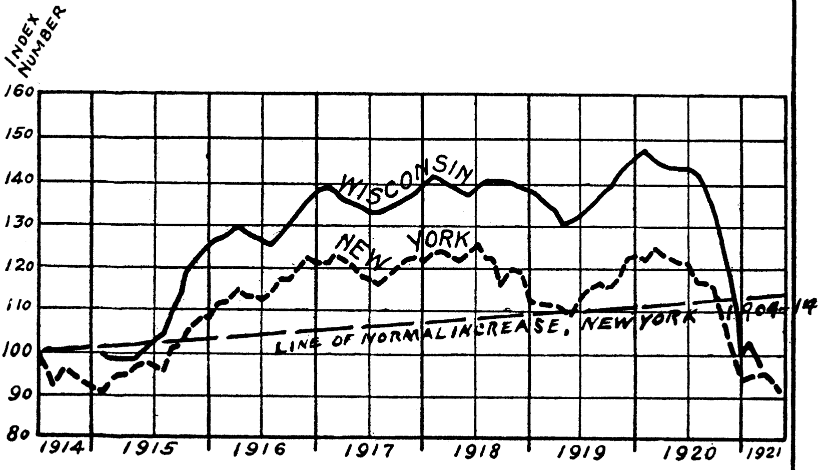
THE SHADED PORTIONS OF THE CHART REPRESENT UNEMPLOYMENT DUE TO LACK OF WORK OR MATERIAL.

The Commonwealth of Massachusetts,
Dept. of Labor & Industries
Division of Statistics

Data on unemployment are sorely needed at present, but the number of items to be secured and the labor of preparing them should both be reduced to a minimum. It is better, however, to get four items that are really needed for information than three which do not tell us what really ought to be known.

Better methods of measuring unemployment can also be worked out

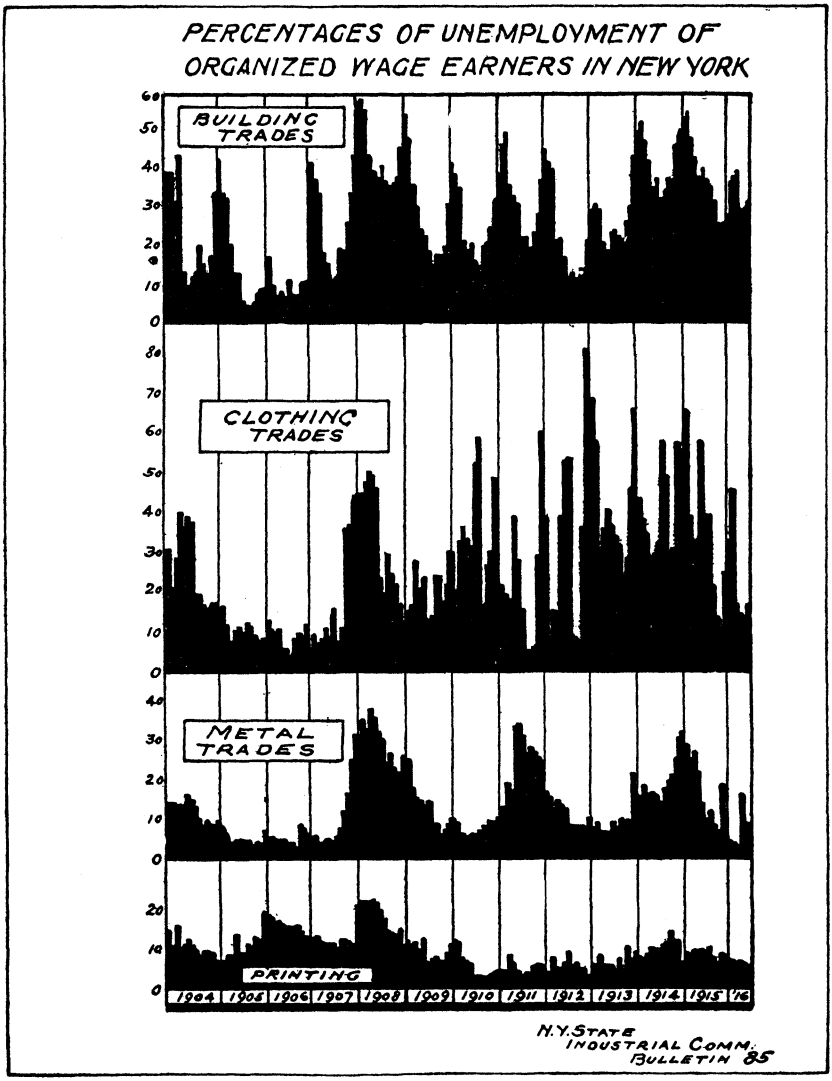
FLUCTUATIONS IN NUMBER OF FACTORY EMPLOYEES
from Pay Roll Data of
REPRESENTATIVE FACTORIES IN THE
STATES OF NEW YORK & WISCONSIN



DATA FROM
STATE of NEW YORK
DEPT. of LABOR
THE INDUSTRIAL COMMISSION
BUREAU of STATISTICS & INFORMATION
WISCONSIN STATE INDUSTRIAL COM'N

for particular industries. This should be seriously undertaken by industrial and business statisticians.

The three accompanying charts are based on data supplied by state bureaus. The first chart, showing the fluctuations in the unemployment of organized wage earners in Massachusetts, is based on data



and a chart furnished by Mr. Roswell F. Phelps, director of the Division of Statistics of the Department of Labor and Industries.

The second chart, showing variations in the number of factory employees in representative factories in New York and Wisconsin, is made from data supplied by Dr. E. B. Patton, chief statistician of the New York Department of Labor, and by the Wisconsin State Industrial Commission. The New York curve starts at 100 in July, 1914;

although 100 in the Wisconsin curve is as of February, 1915, the two curves are plotted in this way in order to show more clearly the similarity of movement. The line of normal increase of factory wage earners in New York State from 1904 to 1914—about 12 per cent for the five year period—is based on the figures of the United States Census of Manufactures.

The third chart, showing seasonal and other fluctuations in employment among organized wage earners in certain trades in New York State, 1904–15, is based on charts published in Bulletin No. 85 of the New York State Industrial Commission.

A METHOD OF ESTIMATING THE POPULATION OF CONTINENTAL UNITED STATES FOR INTERCENSAL YEARS

By Donald R. Belcher*

The United States Department of Commerce publishes annually in its *Statistical Abstract* a table showing the estimated population of the United States by years over a considerable period, based on the returns of the decennial censuses of population. For the years prior to that of the latest census, the numerical increase in population in any year is assumed to be one-tenth of the numerical increase shown for the decade to which that year belongs. For years subsequent to the latest census, the annual increase is assumed to be equivalent to that assumed for the years of the preceding decade. These processes of estimation may be simply described as straight-line interpolation and straight-line extrapolation respectively.

It is probably true that until the beginning of the World War these methods yielded results that were not seriously misleading. But during the war a number of influences were at work, the net result of which was to restrict population growth in the United States. Indeed, straight-line extrapolation as applied to the years between 1910 and 1920 on the basis of the censuses of 1900 and 1910 showed an estimated population for 1920 nearly two millions greater than that actually determined by the 1920 census. And now that the 1920 returns are available, straight-line interpolation is equally unsatisfactory for determining the intercensal population during that decade, since it is apparent that these restrictive influences did not become operative until 1914.

An analysis of available statistics on births, deaths, immigration, and emigration during the period from 1910 to 1920 has been found to

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* Mr. Belcher is associated with the Statistical Division, American Telephone and Telegraph Company.